HERMS (Heat Exchanger Recirculating Mash System) Controller

Your new HERMS controller

Thanks for buying your controller from us!!! Your controller is based on two MYPIN TA4 series PID controllers. Unlike cheap REX branded controllers, MYPIN controllers are manufactured in China using modern Surface Mount technology. This is the same technology used to manufacture your high quality cell phone.

Controller safety

We use only aluminum housings for our controllers. We could save $10 to $30 per controller by switching to plastic housings. But we want to make sure if the unthinkable happens, that if your controller were to fail, all of the energy is safely contained inside your controller housing. We can't make that guarantee with a plastic housing and neither can anyone else with a plastic housing. Under the wrong conditions a plastic housing could melt down, catch on fire and burn your house down!

All of our controllers have been tested behind GFCI and are GFCI compliant. We highly recommend that you run your controller on a GFCI protected circuit. But even with GFCI you are mashing with live power and it takes very little current to kill, so please follow these basic safety rules.

1. Never brew standing in water or in the rain.
2. Never plug in or unplug your heater or pump with the power on.
3. Never brew with a known electrical problem.
4. Never touch any nearby metal object when touching your brew equipment.
5. Never leave your system on & unattended.
6. STOP and investigate if you smell something “electrical”, or feel a shock from your equipment.

Getting familiar with your new controller

Your new HERMS controller has a total of eight controls on the front panel

A red mushroom button at the bottom left that serves as an on/on switch as well as a panic stop button. Twist the mushroom button to the right to turn on main power and push the mushroom button in to turn off main power.

One MYPIN TA4 controller at the top right area that manages your HERMS temperatures

The dial at the top left that sets your rate of boil.

Four switches at the bottom right.

A alarm on/off switch

A mode switch to flip between boil and mash.

Two pump on/off switches to manage your 120V circulation and transfer pumps.

Your new HERMS controller has seven features on the bottom panel.

Main incoming power - bottom, right
Mash temperature sensor in – top, left
Expansion port socket – next position to the right
Note: The sensor port is three wire, expansion port is 4 wire
Boil and Mash (HERMS) Control Outlets – bottom, left
Pump Control Outlets – top, right

Expanding Your System

Your HERMS controller is designed for expansion in mind. We accomplish this with expansion modules that can be daisy chained to your original control module.

Want to expand from 6 to 12 gallon boil? No problem, just add an additional element to your boil pot, expand your electrical panel to 50 Amps, add an additional outlet then plug in one of our expansion modules with the supplied cable. Set the rotary switch on your expansion module to boil and its element will cycle on and off in time with the first element in your brew pot.

HERMS tank isn't heating fast enough? Again, no problem, just add an additional element to your HERMS tank, add an additional outlet and then daisy chain another one of our expansion modules into the first one with the supplied cable. Set the rotary switch on this expansion module to mash and its element will cycle on and off in time with the first element in your HERMS tank. And because only two elements are ever on at one time there's no need to expand your electrical panel beyond 50 Amps! You can daisy chain up to 4 expansion modules.

Main Power, Pump Control and GFCI Protection

Your 240V controller has a 12' 10 gauge heavy duty power cord. To be able to support a 240V element and a 120V pump and be GFCI compliant your controller will have a 4 prong "dryer plug" or a 4 prong twist lock plug. All 240V models ship with standard 3 prong twist lock 30 Amp rated power sockets for your heater element plugs and a 3 prong 120 Volt 15 Amp outlets for your pumps. Your controller is designed to plug into a 30 Amp dryer style outlet and can safely manage a heating element as large as 6000 Watts.

> ***Warning: Do not attempt to plug additional heating elements into the pump outlets of your HERMS controller. Doing so will damage your controller and void your warranty!***

We highly recommend that you install a spa panel that incorporates GFCI to protect you and your brewery.

A note on pumps: A 809 series March Pump draws 1.5 Amps (180 Watts) and you should factor in this wattage when planning your HERMS set-up. Also, all electric motors draw surge current of up to 6X their running current when starting. We include separate pump and mash switches so that you can to start your pump first then start your PID controller, eliminating any effect the surge current might have on your mash cycle.

MYPIN Controller Features

Top Row – Displays the current temperature
Second Row – Displays the set temperature (the temperature you want to regulate to
Out1 – Is on - red when the element is on & off when the element is off
Out2/AL2 – Not used in our application
AL1 – Turns on when AL1 value is crossed. If you use the temperature alarm, set the temperature to where you want the alarm to sound. We pre-set AL1 to 170F.
AT – On when in auto tune mode

- Hold down to go into programming mode

+ 

- Change the set temperature – Press 

then 

until the second row, right digit is flashing to change temp.

- Press to select the set temperature digit you want to modify


- Press to move digit up or down

- Hold down to auto tune

Power On with No Heaters On

To turn power on and run your pumps without any heaters turned on:

Set your BOIL/MASH switch to BOIL
Set your boil knob to 0 (clicked OFF)

HERMS Thermal Considerations

A HERMS tank's heating requirements are unique – you are usually heating your mash and your HERMS tank water with one 5500 Watt element and some systems built from two 14.5 gallon converted (1/2 barrel) kegs need a little extra push. Because of the additional thermal mass of two tanks, some home brewers set up their HERMS tank with an electric element for temperature control plus a propane burner underneath to help boost your water from tap temperature to your initial strike temperature.

You'll also discover that dough-in temperature drop is less with HERMS than with a standalone mash tun. This is because the additional water in the HERMS tank helps to stabilize your mash temperature during dough-in.

Initial Strike Water

Your initial strike water will be heated by your HERMS coil, then once your strike temperature is reached, incorporate your grain into the water in your mash tun with your HERMS circulation pump running. Experience with your set-up will tell you how much water to start with and what to set your initial strike temperature to.

Basic MASH Operation

For single-step mash you should set the controller to your mash temperature and leave it set. For convenience we test all of our controllers at 145F, the most common temperature for a single step mash, and if you mash at 145F you may not need to make any changes at all!

For a multi-step mash you start at the lowest temperature then increase the temperature based on your mash schedule. We suggest that you do a trial run with water while monitoring the temperature mid-way down your mash tun so that you understand how long it takes for the temperature change to propagate through your system. As with any other system, temperature changes will not be instant because of the time it takes for your pump to circulate water through your system.

Sparge Water

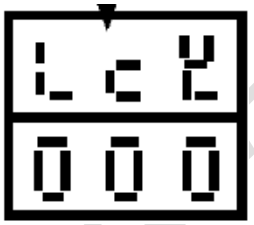
In advantage to a HERMS system is your HERMS tank water is your sparge water. Once your mash-in is complete, you just switch your valves over and sparge with the water you have already heated. There is no separate HLT because your HERMS coil is sitting inside your HLT.

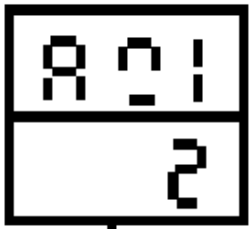
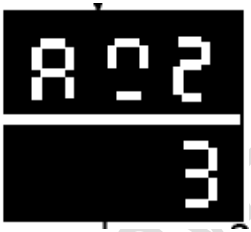
Boil Operation

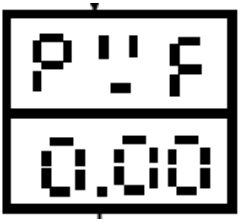
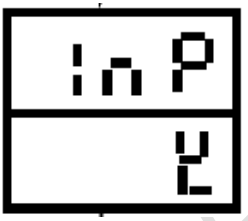
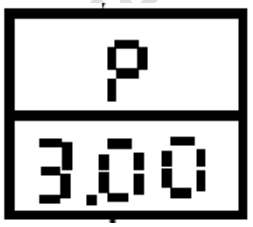
Before you transfer your wort, make sure your boil knob is set to 0 and then flip your BOIL/MASH switch to BOIL. Transfer your wort, then turn the boil knob all the way up until you start boil and then adjust the boil knob to the boil rate you want. Controls are simple and the boil control knob is sensitive enough to set exactly where you want.

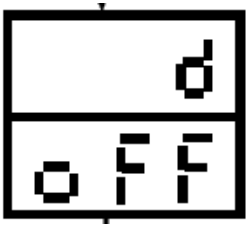
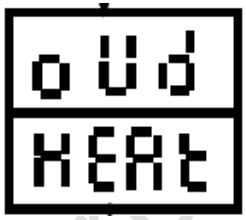
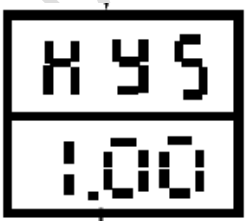
Initial MYPIN Settings

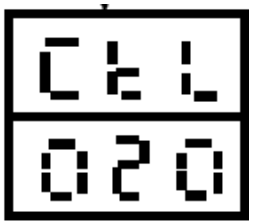
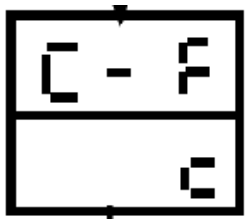
We set the initial settings and calibrate your PT-100 sensor before shipping your controller to you. In most cases you will not need to make any changes but because no two systems are exactly alike you may need to modify these setting to make your HERMS system perform better. To go into programming mode hold down the SET button. Once in programming mode pressing the SET button will go through each of these menus in order.

	**Lock Screen** This is the first screen you enter programming mode. The value should stay set to 000. Press the SET button to advance to the next step.
	**AL1** We pre-set the alarm to 170 because 170F is the denature temperature of your mash enzymes.

	**AL1 Mode** 2 is the default and we leave the setting at 2.
	**AL2** We do not use this.
	**AL2 Mode** We do not use this.

	Offset value used to calibrate your temperature probe. All PT100 RTD temperature probes must be calibrated before they can be used because small differences in the alloys used cause errors in their measurements. A temperature probe only needs to be calibrated once. Also, any new temperature probe must be calibrated before use or your measurements will be off. **We have already calibrated your probe** calibration (PUF setting) for your mash is _____
	Temperature input type. This PID will accept K, J, T, E & S thermocouples and will also accept Pt100 type RTDs. We use PT100 RTDs for accuracy and the input is set to Pt.
	**Proportional Band** This modifies how hard the heating element comes on based on the percentage the temperature is away from your set temp. Default value is 3 but we found that a value of 0.52 works better for our test system.

	**Integral Time Range** This modifies how hard the heating element comes on based on how long your temperature is outside your set temp. Default value is 240 but we found that a value of 110.5 works better for our test system.
	**Derivative Time Range** Default is off but we found that a value of 27.62 works better for our test system.
	**Control Direction** The MYPIN controller can be used to manage heat or cool. Default is heat which is exactly what we need.
	**Control Hysteresis** This sets the amount the temperature is allowed to drift before the PID controller will attempt to correct the temperature. Default is 1 and we leave it set at 1.

	**Output Control Mode** This sets the control (on/off) cycle time in seconds Default time for the model we use is 2 and we leave it set at 2.
	**Measurement and Display** C – Celsius, F = Fahrenheit Default is C and we change the value to F before shipping

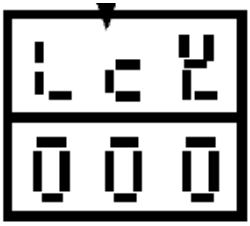
Calibrating your MYPIN Controller for maximum Accuracy

We calibrated your controller at 212F, the boiling point of water, but temperature sensors are not perfectly linear across their entire range. Your HERMS controller should do a great mash right out of the box but to get maximum accuracy you should calibrate your controller at the mash temperature you use most often. For single step mash this is likely in the 143F – 147F range. If you do step mashing you should calibrate to somewhere mid-range. When calibrated to mid-range the actual step temperatures you use will be off by less than one degree F.

To calibrate you need to set the system up with water and use a thermometer you trust. If you don't have one you trust then you'll need to obtain at least three that you can compare. Most homebrewers have one or two and one or two they can borrow from friends.

To start calibration you should place your reference thermometer or thermometers as close to your HERMS temperature sensor as possible. Set your mash temperature then start your mash cycle. Once your temperature stabilizes record your temperatures and use the process below to adjust the PID's offset.

Note: If you use more than one reference thermometer don't be surprised if there is 5 or more degrees difference between them. We've seen as much as 10 degrees difference between household thermometers which is why we calibrate to the temperature of boiling water.

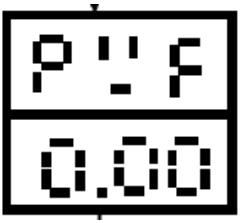


To calibrate to your mash temperature

Press and hold the SET button until LcK shows in the top display

Leave the second line set to 000.

Press and release the SET button 5 times to advance to the PUF step.

	**This is the offset value used to calibrate your thermocouple.** Press the «/AT key to program the offset. As you press the «/AT key you will see each digit in the second line flash. Press the ▲ ▼ keys to move digit up or down. To exit, press and hold the SET button until the top display returns to normal. Note: The offset should be set the same direction as the error. For example, if the PID is 3 degrees F high then +3 is added to the offset that may already be programmed into the PUF value.

Fine Tuning your Controller's P, I and D Settings

The advantage of a PID controller over a thermostat is a PID controller anticipates temperature change. When your wort temperature starts to drop the controller sees the drop and starts applying heat to prevent it. But no single calibration is perfect for every system, so before using your controller you should do a trial run with water.

When your set-up is correct you should see the temperature rise to your set temp, over shoot a little then come back down to your set temp. Then the temperature should fluctuate slightly above and below your set temp. How fast this happens depends on the water volume you use and your system's configuration. If your mash temperature over shoots your setting then stays high you should try reducing your PID's 'I' value then reducing your PID's 'P' value. If your mash temperature does not quite reach your set temperature and it stays low then you need to look at the first

three items on the list below. If none of these are a correctable factor then start increasing the 'I' value until your temperature runs high then reduce until your temperature is in control. If changing 'I' value does not seem to have an impact then you should increase the 'P' value.

The fastest way to tune your controller is with the PID's auto-tune feature, then once tuned you can play with the P, I and D settings to make your HERMS controller more accurate.

To auto-tune your HERMS controller:

- Fill your mash tun with the amount of water you would usually use for dough-in, then add additional water equal to about half your grain bill.
- Fill your HERMS tank until your HERMS coil is completely covered plus a couple of inches.
- Start your HERMS coil circulation and your HERMS tank circulation.
- Plug in and start your controller and let it heat to within 10 degrees of the set temperature.
- Press and hold the 

button until the AT light comes on then release.
- Wait for the auto tune cycle to complete.
  During auto tune the temperature will go past the set temperature and then will come back down.
  This is normal.
- Auto tune will be complete when the AT light goes off.
- You should not need to auto tune again unless you are making major changes to your grain bill.

If your temperature consistently runs low after auto tuning your controller then you need to look at the first three items on the list below.

Five main factors control the accuracy of your MYPIN controller.

Heating Element Size – Your heating element size, or more correctly your heating element size relative to your mash size will impact the stability of your mash temperature. The 5500 Watt element most home brewers use in their 240V RIMS tube or mash tun is more than large enough for up to a 20 gallon or larger grain bill, and can easily bring a 10 gallon grain bill from faucet temperature to mash temperature within 30 minutes.

It's easy to tell if your heating element is under size. Once you reach mash temperature your element should be off more time than on. You can monitor the element by watching the red OUT1 light on the PID. If the red light is on more than it's off then the element is working very hard to keep your mash up to temperature and it's under sized.

Circulation – Regardless of how your home HERMS brewery is set up, circulation is critical. Without enough circulation your temperature will stratify. Without circulation your mash temperature will always be hotter nearer your element than further away from the element.

Note: regardless of the system you use you should expect some delay between your PID setting and your overall mash temperature because the temperature change will move through your mash in a wave.

Radiation and Evaporation Losses – As you heat your mash you are also constantly loosing heat through the sides and top of your HERMS tank and mash tun. Most heat is lost from the top surface of your mash and HERMS because you lose radiant heat and evaporation heat from the top surface. You should always keep a cover on your HERMS tank and mash tun during mash to minimize both.

The PID 'P' Setting – This setting modifies how strong the heating element comes on relative to how far off your mash temperature is.

The PID 'I' Setting – This setting modifies how strong the heating element comes on relative to how long your mash temperature has been low.

Converting the 240V controller from 4 Prong to 3 Prong power plug

All of our controllers have been tested behind GFCI and are GFCI compliant. We highly recommend that you run our controllers on GFCI protected circuits. But we understand that some older houses have non-GFCI compatible 3 wire dryer outlets and dryer outlets are a favorite 240V power sources for home breweries. **Converting your controller from 4-prong to 3-prong power will make your controller non-GFCI compliant.**

You can convert your controller to 3-prong power by removing our 4-prong plug and installing your own 3-prong plug. When installing your own 3-prong plug, the red and black wires wire attach to the two side blades, then the green AND white wires attach together to the center ground blade.